3.2 Medical Requirements Overview

TABLE 3.2: MEDICAL REQUIREMENTS OVERVIEW

MEDB# and Title:	MEDB 8.1 Nutritional Assessments
Sponsor:	Medical Operations
IPT:	Nutrition
Category:	Medical Requirements
References:	SSP 50260 ISS Medical Operations Requirements Document (MORD) SSP 50667 Medical Evaluations Document (MED) Volume B
Purpose/Objectives:	Nutritional assessment is required to determine adequacy of nutrient stores prior to flight, to assess nutrient intake and status during flight, and to assure correction of nutritional status following flight. Assessment of body composition is required to determine changes in muscle and bone compartments during space flight.
Measurement Parameters:	Dietary intake, biochemical indices of nutritional status and anthropometric information.
Deliverables:	Dietary intake and body composition data; indices of: protein, calcium/bone, antioxidant, iron, mineral, and vitamin status; blood chemistry and renal stone risk profile data, and MAT report to Crew Surgeon.
Flight Duration:	≥ 30 days
Number of Flights:	All Flights
Number and Type of Crew Members Required:	All Crewmembers. Back-up crew will only complete preflight MATs greater than L-45 days unless specifically waived by crew surgeon. If crew swap does occur, back-up crew will complete all preflight MATs.
Other Flight Characteristics:	N/A

3.3 Preflight Training

TABLE 3.3: PREFLIGHT TRAINING

Preflight Training Activity **Description:**	Familiarization and training will be conducted. The familiarization sessions will include an overview of all nutritional assessment procedures. Training will include hands-on use of the FFQ. Training on the use of the BCR will be covered under existing HRF protocols. Review of BCR and FFQ procedures will be provided in a refresher session. Training for the use of the MMD will be provided per MR024L. Training for the PCBA will be provided per MR018L.			
	Duration:	**Schedule:**	**Flexibility:**	**Personnel Required:**
Schedule:	Familiarization and FFQ Training 75 minutes	L-180 days	N/A	Trainers/Crewmembers
	FFQ and BCR Refresher 45 minutes	L-45 to L-30 days	N/A	Trainers/Crewmembers

Ground Support Requirements Hardware/Software	**Preflight Hardware:**	**Preflight Software:**	**Test Location:**
	MEC with Food Frequency Questionnaire (FFQ)	FFQ Questionnaire	U.S.
	Mass Measuring Device (MMD)	N/A	Russia
	Portable Clinical Blood Analyzer (PCBA)*[1]	N/A	U.S.
	Barcode Reader (BCR)*[2]	N/A	U.S.

Training Facilities	**Minimum Room Dimensions:**	**Number of Electrical Outlets:**	**Temperature Requirements:**	**Special Lighting:**
	8ft x 10ft	3 (U.S.-110V, Russia-220V)	Ambient	None
	Hot or Cold Running Water:	**Privacy Requirements:**	**Other:**	
	Yes - both	Yes	Tables (2 at 3ft X 6 ft), Chairs (4)	

Constraints/Special Requirements:	Training on the use of the MMD is scheduled and conducted by GCTC personnel in Star City (see MR024L Body Mass Measurement).
Launch Delay Requirements:	None
Notes:	*Shared with 1. In-flight 30 Day Health Status Examination (MR018L) 2. Human Research Facility (HRF).

3.4 Preflight Activities

TABLE 3.4: PREFLIGHT ACTIVITIES

Preflight Activity **Description:**	Nutritional assessment will include determination of typical dietary intake using standard Dietary Assessment Questionnaire (DAQ) at L-180. Blood samples and 48 hour void-by-void (VxV) urine pools will be collected for determination of nutritional status, which will include: Body Mass and Composition Protein status Calcium /Bone status Antioxidant status Water-soluble vitamin status Iron status Mineral status General blood chemistry Fat-soluble vitamin status Renal stone risk Body composition assessment will include height and DEXA. DEXA data will be obtained by Bone Densitometry (MR035L). Data will be examined and the necessity/details of a diet prescription will be assessed.			
Schedule:	**Duration:**	**Schedule:**	**Flexibility:**	**Personnel Required:**
	Nutritional Status Assessment: 2 day protocol, includes body weight/height, DAQ, baseline blood collection on Day 1 (80 min) and 48h of void by void urine collection (20 min)	**L-180 days** Day 1 Ht/Wt: 5 min Blood draw: 10 min DAQ: 45 min VxV urine: 20 min Day 2 VxV urine: 20 min Day 3 Close-out void	N/A	Crewmembers must fast on L-180. Note: L-180 DEXA data obtained per MR035L.
	Nutritional Status Assessment: 2 day protocol, includes body weight/height, baseline blood collection on Day 1(35 min) and 48h of void by void urine collection (20 min)	**L-45/L-30 days** Day 1 Ht/Wt: 5 min Blood draw: 10 min VxV urine: 20 min Day 2 VxV urine: 20 min Day 3 Close-out void	N/A	Lab personnel/Crewmembers Note: L-45/30 DEXA data obtained per MR035L.

TABLE 3.4: PREFLIGHT ACTIVITIES (continued)

Ground Support Requirements Hardware/Software	**Preflight Hardware:**	**Preflight Software:**	**Test Location:**
	Dietary Assessment Questionnaire (DAQ)	N/A	U.S./Russia
	DEXA (Hologic)	N/A	U.S.
	Blood and Urine Collection Supplies	N/A	U.S./Russia
	Body Mass Scale	N/A	U.S./Russia
	Stadiometer	N/A	U.S./Russia
	Centrifuge	N/A	U.S./Russia
	Freezer	N/A	U.S./Russia
	Refrigerator	N/A	U.S./Russia

Testing Facilities	**Minimum Room Dimensions:**	**Number of Electrical Outlets:**	**Temperature Requirements:**	**Special Lighting:**
	8ft x 10ft	3 (U.S.-110V, Russia-220V)	Ambient	None
	Hot or Cold Running Water:	**Privacy Requirements:**	**Vibration/Acoustic Isolation:**	**Other:**
	Yes – both, and distilled water	Yes	No	Tables (2 at 3ft X 6ft); Chairs (4)

Constraints/Special Requirements:	Subject must fast for at least 8 hours before baseline blood and urine samples are collected.
Launch Delay Requirements:	The L-45/30 data collection session will be repeated if the launch is delayed by more than 60 days, or as defined by the Flight Surgeon.
Notes:	A detailed list of the individual tests is located in the Appendix. Further descriptions available in JSC 28566, Nutritional Status Assessment for Extended Duration Space Flight.
Data Delivery	**Data/Report to Designated Recipients (Nominal/Contingency):**
	A report to the Crew Surgeon and data for archiving will be delivered within 7 days of closeout urine collection.

3.5 In-Flight Activities

TABLE 3.5.1: IN-FLIGHT ACTIVITIES

<table>
<tr><td>In-Flight Activity
Description:</td><td colspan="6">Crewmember will perform an estimation of food intake weekly using an electronic FFQ. The results of the FFQ will be downlinked each week. Body mass will be determined every 14 days using a Mass Measurement device (MMD) per MR024L. Blood chemistry data (via PCBA) will be obtained from the Physical Exam every 60 days per MR018L, and downlinked to the ground. These data will contribute to ongoing nutritional status assessment reports, which will be provided to the Flight Surgeon and to the crewmember during the mission through the Private Medical Conference (PMC) with the Flight Surgeon. At Flight Surgeon discretion, a more detailed dietary intake record may be ordered (obtained via the barcode reader or written log).</td></tr>
<tr><td rowspan="6">Schedule:</td><td>Activity:</td><td>Duration:</td><td>Schedule:</td><td>Flexibility:</td><td>Blood Volume:</td><td>Personnel Required:</td></tr>
<tr><td>FFQ (on MEC)</td><td>15 minutes</td><td>As clinically indicated</td><td>N/A</td><td></td><td>Crewmembers</td></tr>
<tr><td>FFQ Downlink</td><td>shared</td><td>Weekly</td><td>N/A</td><td></td><td>Crewmembers</td></tr>
<tr><td>MMD</td><td>Shared from MR024L</td><td>Monthly or as clinically indicated</td><td>N/A</td><td></td><td>Crewmembers</td></tr>
<tr><td>PCBA analysis</td><td>Shared from MR018L</td><td>Every 60 days</td><td>N/A</td><td></td><td>Crewmembers</td></tr>
<tr><td>Detailed Dietary Log</td><td>30 min./day, as required</td><td>Contingency.
At discretion of Flight Surgeon</td><td>N/A</td><td></td><td>Crewmembers</td></tr>
<tr><td>Procedures:</td><td colspan="6">Procedures will be contained within the Medical Operations procedures book. Procedures will include nominal and contingency operations for use of the Food Frequency Questionnaire (FFQ).</td></tr>
<tr><td>Constraints / Special Requirements:</td><td colspan="6">Per MR018L, PCBA cartridges require late stow and refrigeration at +4 - +8 C.</td></tr>
<tr><td>Photo / TV Requirements:</td><td colspan="6">N/A</td></tr>
<tr><td>Cold Stowage Requirements:</td><td colspan="6">Per MR018L, PCBA cartridges require refrigeration at +4 - +8 C.</td></tr>
<tr><td>Mission Extension Requirements:</td><td colspan="6">N/A</td></tr>
<tr><td>Landing Wave-Off Requirements:</td><td colspan="6">N/A</td></tr>
<tr><td rowspan="2">Data Delivery</td><td colspan="6">Data/Report to Designated Recipients (Nominal/Contingency):</td></tr>
<tr><td colspan="6">Dietary data will be delivered to the Flight Surgeon within 48 hours of receipt in the Nutritional Biochemistry Laboratory.</td></tr>
</table>

TABLE 3.5.2: IN-FLIGHT HARDWARE

Hardware/Software Name	P/N
MEC	SEG46116031-XXX
MMD	5A1.540.156
PCBA	TBD
BCR	TBD

3.6 Postflight Activities

TABLE 3.6: POSTFLIGHT ACTIVITIES

Postflight Activity **Description:**	Postflight nutritional assessment will be conducted in conjunction with existing medical exams when possible. Biochemical testing and body composition assessment will be performed at R+0 (and repeated, at Crew Surgeon discretion). Blood samples and 48-hour VxV urine pools will be collected for determination of nutritional status and renal stone risk as described above. Body composition assessment will include height and bone densitometry (DEXA) on R+5/7. DEXA data will be obtained per MR035L. Postflight debriefs will be conducted with crewmembers and flight surgeons, to review cumulative data. Data will be examined and the necessity/details of a diet prescription will be assessed.			
Schedule:	**Duration:**	**Schedule:**	**Flexibility:**	**Personnel Required:**
	Nutritional Status Assessment: 2 day protocol, includes body weight/height, baseline blood collection on Day 1 and 48h of void by void urine collection shared 20 minutes	**R+0** <u>Day 1 (R+0)</u> Ht/Wt: shared Blood draw: shared VxV urine: shared <u>Day 2</u> VxV urine: 20 min <u>Day 3</u> Close-out voids **R+5/7 days** DEXA per MR035L protocol **R+20/30 days**	N/A N/A N/A	Lab personnel/Crewmembers Lab personnel/Crewmembers Lab personnel/Crewmembers
Ground Support Requirements Hardware/Software	**Postflight Hardware:**	**Postflight Software:**	**Test Location:**	
	Same as preflight	N/A	U.S/Russia DEXA/U.S. only	

TABLE 3.6: POSTFLIGHT ACTIVITIES (continued)

Testing Facilities	**Minimum Room Dimensions:**	**Number of Electrical Outlets:**	**Temperature Requirements:**	**Special Lighting:**
	8'X10'	3(U.S.-110V, Russia-220V)	Ambient	None
	Hot or Cold Running Water:	**Privacy Requirements:**	**Vibration/Acoustic Isolation:**	**Other:**
	Yes – both	Room with limited access	N/A	Tables(2 at 3'x 6') Chairs (4)
Constraints/Special Requirements:	R+0 blood collection should be performed as soon as possible after landing.			
Early Destow / Early Return:	N/A			
Notes:	N/A			
Data Delivery	**Data/Report to Designated Recipients (Nominal/Contingency):**			
	A report to the Crew Surgeon and data for archiving will be delivered within 7 days of closeout urine collection. Postflight debriefs will also be conducted with crewmembers and Flight Surgeons to review cumulative mission data.			

3.7 Summary Schedule

TABLE 3.7: SUMMARY SCHEDULE

ACTIVITY	DURATION	SCHEDULE	FLEXIBILITY	BLOOD VOLUME	PERSONNEL REQUIRED	CONSTRAINTS
Preflight Training						
Familiarization and FFQ Training	75 minutes	L-180 days	N/A	N/A	Trainers/Crewmembers	N/A
FFQ and BCR Refresher	45 minutes	L-45 to L-30 days	N/A	N/A	Trainers/Crewmembers	N/A
Preflight						
Nutritional Status Assessment: 2 day protocol, includes body weight/height, DAQ, baseline blood collection on Day 1 and 48h of void by void urine collection	80 minutes 20 minutes	**L-180** Day 1 Ht/Wt: 5 min Blood draw: 10 min DAQ: 45 min VxV urine: 20 min Day 2 VxV urine: 20 min Day 3 Close-out void	N/A	23.2 ml	Lab personnel/ Crewmembers	Crewmembers must fast on L-180. Needle-stick. Blood volume is decreased by 3.0 ml when scheduled with routine physicals **Note:** L-180 DEXA data obtained per MR035L.
Nutritional Status Assessment: 2 day protocol, includes body weight/height, baseline blood collection on Day 1 and 48h of void by void urine collection	35 minutes 20 minutes	**L-45/L-30 days** Day 1 Ht/Wt: 5 min Blood draw: 10 min VxV urine: 20 min Day 2 VxV urine: 20 min Day 3 Close-out void	N/A	23.2 ml	Lab personnel/ Crewmembers	Needle-stick. Blood volume is decreased by 3.0 ml when scheduled with routine physicals Crewmembers must fast on Day 1. **Note:** L-45/30 DEXA data obtained per MR035L.

TABLE 3.7: SUMMARY SCHEDULE (continued)

In-Flight	Duration	Schedule	Flexibility	Blood Volume	Personnel Required	Constraints
FFQ (on MEC) FFQ Downlink MMD PCBA analysis Detailed Dietary Log	15 minutes shared shared shared 30 min./day, as required	As clinically indicated Weekly Monthly or as clinically indicated Every 60 days Contingency. At discretion of Flight Surgeon	N/A	N/A	Crewmembers Crewmembers Crewmembers Crewmembers Crewmembers	None None Part of routine physical (MR018L) Part of routine physical (MR018L) N/A
Wheels-Stop –N/A						
Postflight						
Nutritional Status Assessment: 2 day protocol includes body weight/height, baseline blood collection on Day 1 and 48h of void by void urine collection. DEXA	Shared 20 minutes	**R+0** <u>Day 1 (R+0)</u> Ht/Wt: shared Blood draw: shared VxV urine: shared <u>Day 2</u> VxV urine: 20 min <u>Day 3</u> Close-out voids **R+5/7** DEXA per MR035L protocol **R+20/30**	N/A N/A N/A	20.2 ml	Lab personnel/ Crewmembers Lab personnel/ Crewmembers Lab personnel/ Crewmembers	No additional R+0 time required. Ht/Wt, blood draw, and 24-h urine collection obtained as part of the routine landing physical. Additional blood required.
Postflight Debrief						
Postflight debriefs will be conducted with crewmembers and Flight Surgeons to review cumulative mission data.						